



## PATENT SPECIFICATION

DRAWINGS ATTACHED

931,452

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**Index at Acceptance:** Class 103(1), E1A1(A1:A2:B:C), E1(A1D2:E), E2N1A(1:2:4A1:4A2:5), E2N1C2C, E2N1D(2B:6A:6B: 6C1:6C2), F1C(1:2X).  
**International Classification:** F06d.

**Improvements relating to disc brakes.****COMPLETE SPECIFICATION**

We, GIRLING LIMITED, a British Company of Kings Road, Tyseley, Birmingham 11, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with improvements in disc brakes of the caliper type in which friction pads are adapted to be urged into engagement with opposite sides of a disc rotating with the wheel or other part of the vehicle transmission, at least one pad being urged into engagement with the disc by a piston working in an hydraulic cylinder located in or on the caliper, the piston and the pad being separate to permit easy removal of the pad.

In such brakes the caliper and the disc may be relatively movable, the pad or pads on one side of the disc being secured directly to the caliper and the pad or pads on the other side of the disc being associated with one or more cylinders.

Alternatively, the caliper may be fixed relative to the disc and provided with cylinders or banks of cylinders on both sides of the disc.

In the usual arrangement the friction pad is backed by a steel or other backing plate which is engaged by the inner end of the hydraulic piston.

When the brake is applied, the energy absorbed is largely converted into heat of which a proportion is transferred from the disc to the caliper by radiation, by air heated by the disc and impinging on the caliper, and by conduction through the friction pads and/or the backing plates to the pistons and so to the caliper body and brake fluid.

Overheating of the caliper body causes damage to the rubber seals of the pistons and to the rubber boots, and if the brake is heated to a sufficient temperature it vapor-

ises and the efficiency of the brake falls off seriously.

These disadvantages are to some extent avoided by our invention which comprises a caliper type disc brake of the kind in which a friction pad means is urged into engagement with the disc by a piston working in a cylinder of the caliper, the friction pad means and the piston being separate to allow easy removal of the friction pad means characterised in that there is an air space enclosed between the piston and the friction pad means and bounded by those two components, and passage means are provided through which the air space communicates with the outside atmosphere and which permit the circulation of air through the air space.

Embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:—

Figure 1 is a side elevation of a caliper of a disc brake constructed in accordance with one embodiment of the invention;

Figure 2 is a section on the line 2—2 in Figure 1;

Figure 3 is an isometric view of a backing plate of the caliper shown in Figures 1 and 2;

Figure 4 is a side elevation of part of a caliper of a disc brake constructed in accordance with another embodiment of the invention;

Figure 5 is a section on the line 5—5 in Figure 4;

Figure 6 is an isometric view of a piston of the caliper shown in Figures 4 and 5.

Each of the calipers shown in the drawings is of a well-known type comprising a U-shaped housing 10 adapted to straddle the edge of the braking disc (not shown) which rotates with the wheel. The limbs of the housing are formed with opposed cylinders 11 containing pistons 12 which can be protruded from the open ends of the cylinders

to urge friction pads 13 into engagement with opposite sides of the disc.

The friction pads 13 are of segmental form and are secured to steel backing plates 14 which are mounted in guides in the limbs of the caliper for movement towards and away from the disc. A pad and its backing plate together form a unit which can be readily removed from, and inserted into, its guide through an opening 15 in the outer edge of the caliper. Once they have been assembled to the caliper, these units are kept in their guides by retaining pins 16 which span the opening. The ends of the retaining pins are screw-threaded and are anchored by nuts 17 to the limbs of the caliper.

Hydraulic fluid supplied under pressure to the caliper reaches the left hand cylinder through the ducts 18 which serve to connect the outer ends of the cylinders. Duct 19 on the right hand cylinder is used for the purpose of bleeding air from the system after which the duct is normally closed by a bleed screw. Leakage of hydraulic fluid past the piston and the ingress of dirt to the bearing surface of the piston and the cylinder are prevented by a sealing ring 20 and a flexible rubber boot 21, which is secured at its opposite ends to the piston and the cylinder respectively.

The piston is hollow and its open face lies adjacent to the backing plate so that the cavity constitutes an air space 22 between the plate and piston. This arrangement materially reduces the area of direct contact between the plate and the piston, with the result that the path through which heat can flow by conduction from the friction pad to the piston and so to the body of the caliper is restricted. The risks of boiling of the hydraulic fluid and of over-heating of the caliper, with consequent perishing of rubber seals, are therefore greatly minimised.

The arrangement is still further improved by the provision of air passages which allow the circulation of air between the piston and the backing plate, and which reduce still further the area of contact between the piston and the backing plate.

In the embodiment of the invention illustrated by Figures 1 to 3, these air passages are constituted by a ring of shallow, radial grooves 23 which are formed in the backing plate just opposite the rim of the piston. When the vehicle is in motion, air is forced through some of these grooves into the cavity of the piston. The bed of each groove is curved so that a current of air flowing through it is to some extent directed axially into the air space close to the internal sur-

face of the piston. Also the circulation of air through the air space is assisted by convection for as the temperature of the air in the cavity rises, it tends to flow out through the uppermost grooves and is replaced by cooler air flowing in through the lower grooves.

In the embodiment shown in Figures 4 to 6, the air passages are formed as a ring of notches 24 in the rim of the piston.

#### WHAT WE CLAIM IS:—

1. A caliper type disc brake of the kind in which a friction pad means is urged into engagement with the disc by a piston working in a cylinder of the caliper, the friction pad means and the piston being separate to allow easy removal of the pad upon wear characterised in that there is an air space enclosed between the piston and the friction pad means and bounded by those two members, and passage means are provided in the piston or the friction pad means through which the air space communicates with the outside atmosphere and which permit the circulation of air through the air space.

2. A caliper type disc brake according to claim 1 characterised in that the friction pad means comprises a pad and a steel backing plate secured together.

3. A caliper type disc brake according to claim 1 or 2 characterised in that the piston is hollow and its cavity constitutes the air space.

4. A caliper type disc brake according to claim 3 wherein the air passage means comprises a ring of radial notches in the rim of the piston.

5. A caliper type disc brake according to claim 3 as dependent on claim 2 wherein the air passage means comprise a ring of radial grooves in the backing plate opposite the rim of the piston.

6. A caliper type disc brake according to claim 5 wherein the grooves are so formed as to direct air axially into the cavity of the piston.

7. A caliper type disc brake substantially as described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

2 SHEETS

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Sheet 1

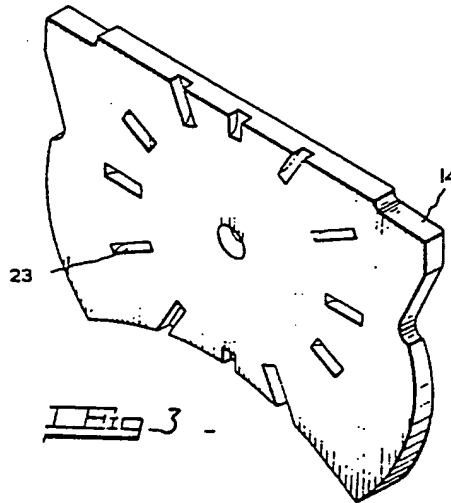
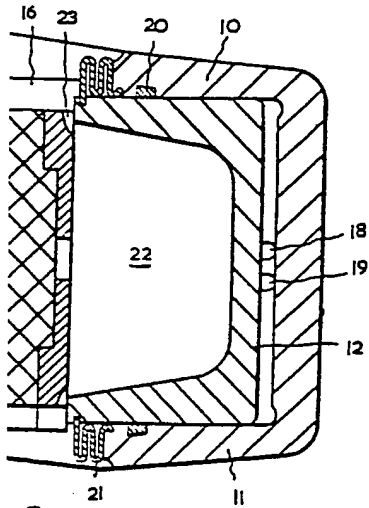


Fig. 3

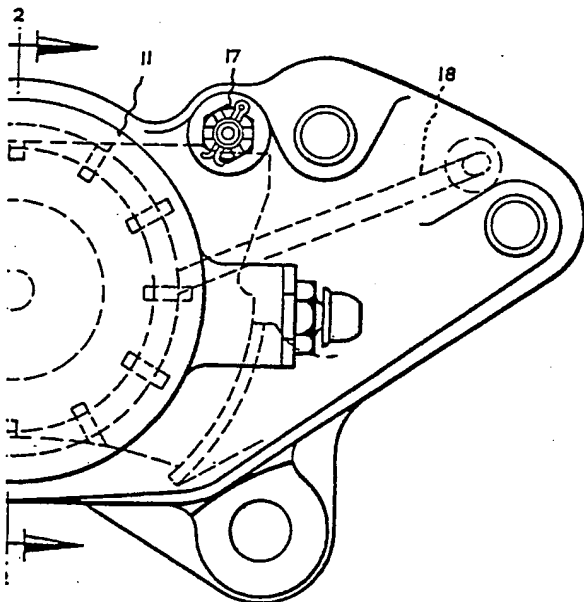
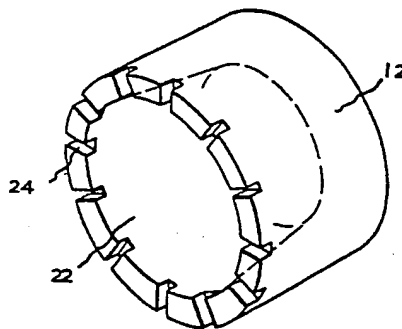


Fig. 6



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 Sheet 1

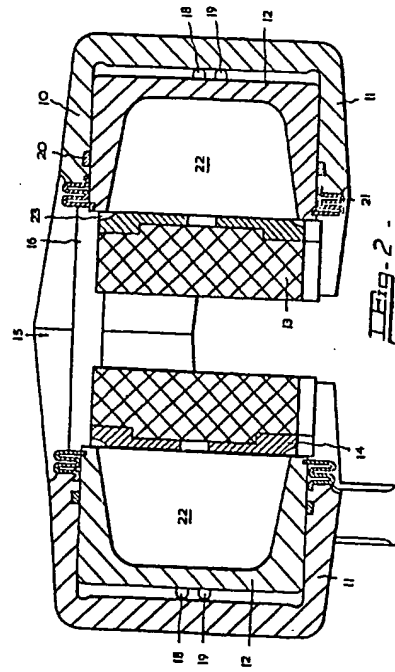


Fig. 2.

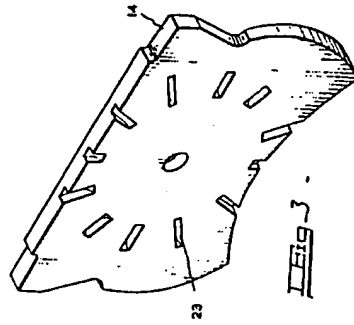


Fig. 3.

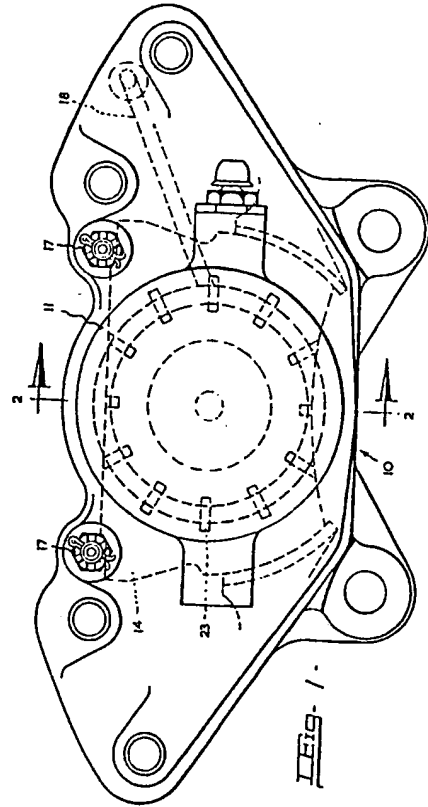


Fig. 1.

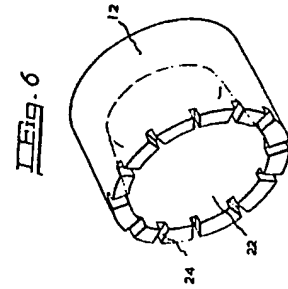


Fig. 6.

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Sheet 2

